Updates on Top mass in the dilepton channel

Outline

- Method overview
- Steps of the analysis
- Latest results
- To do list

The Matrix Element Method

Calculation of a probability density for signal and bkg as a function of the top mass

- convolution of the matrix element of the process with the detector resolution functions
- integration over the unmeas. quantities of the phases space (using VEGAS)

Phase space of unmeasured quantities (numerical integration using VEGAS algorithm)

Transfer fct: probability to reconstruct an object of energy E from a parton of momentum p

$$P_s(\mathbf{x}|M_t) = \frac{1}{\sigma(M_t)} \int d\Phi |M_{t\bar{t}}(q_i, p_i; M_t)|^2 W(p, x) f_{PDF}(gl_1) f_{PDF}(gl_2)$$

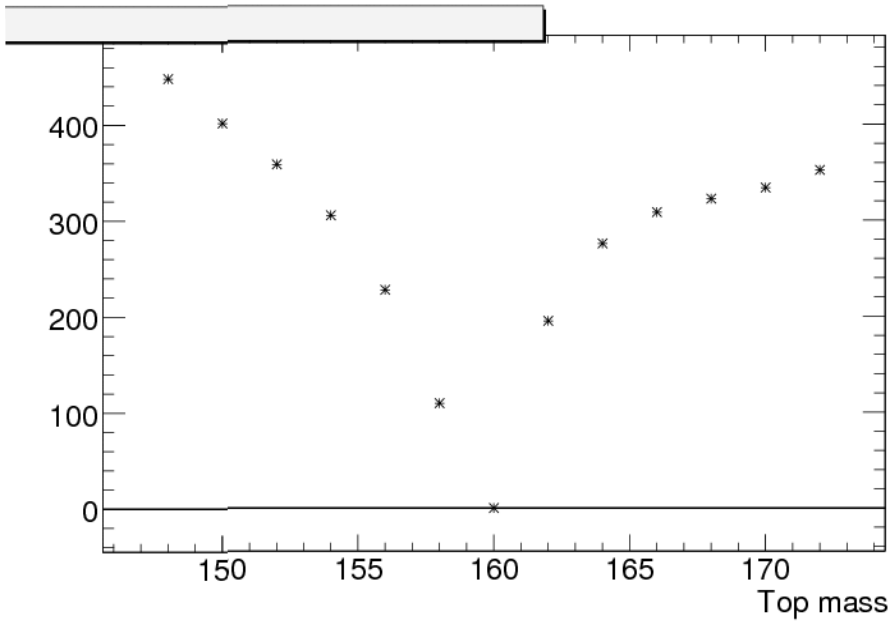
Normalisation factor

LO matrix element calculated with MadGraph

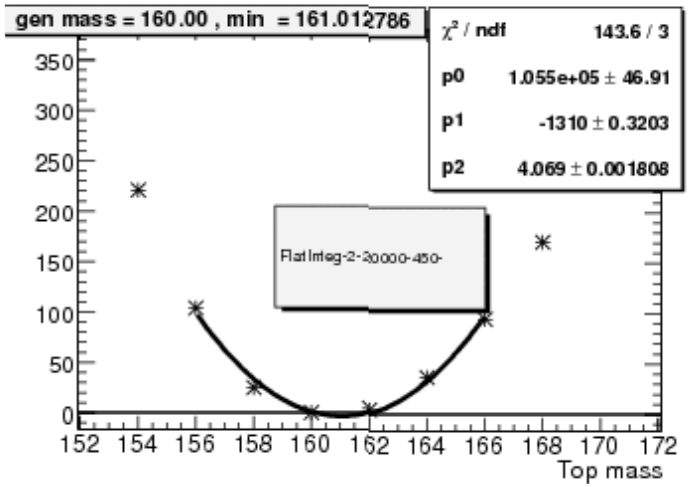
PDFs: probability that the proton contains a parton of momentum gl_i

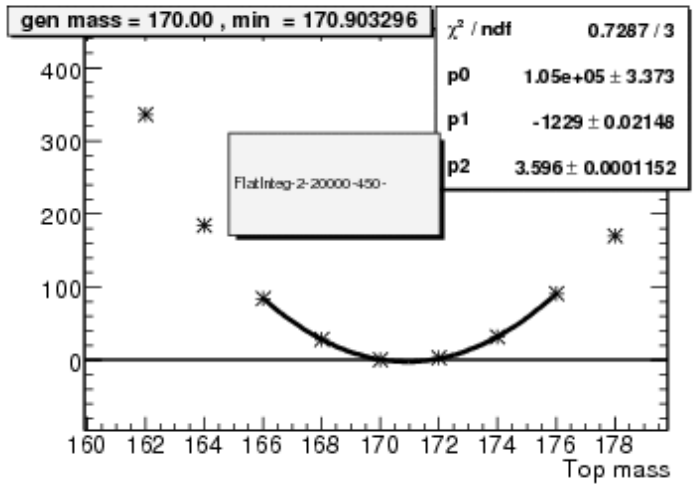
The Matrix Element

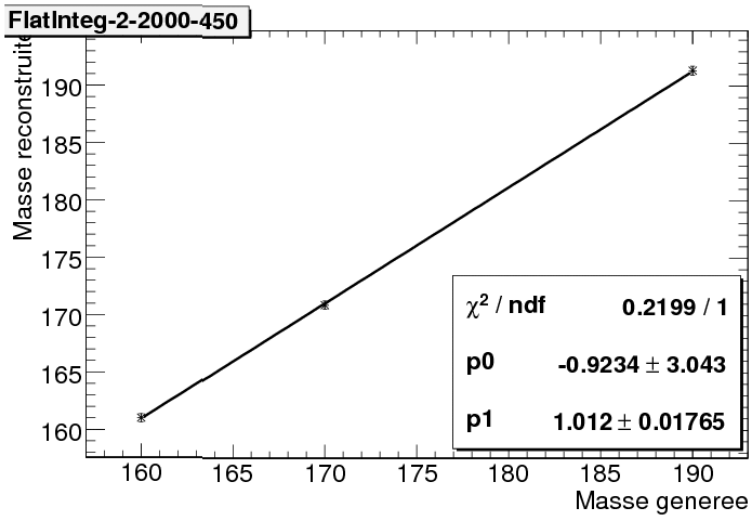
Value of the Matrix Element without convolution with TF
The particles momenta come from Atlas Full-sim (MC@NLO)



Integration over phases space unmeas. quantities





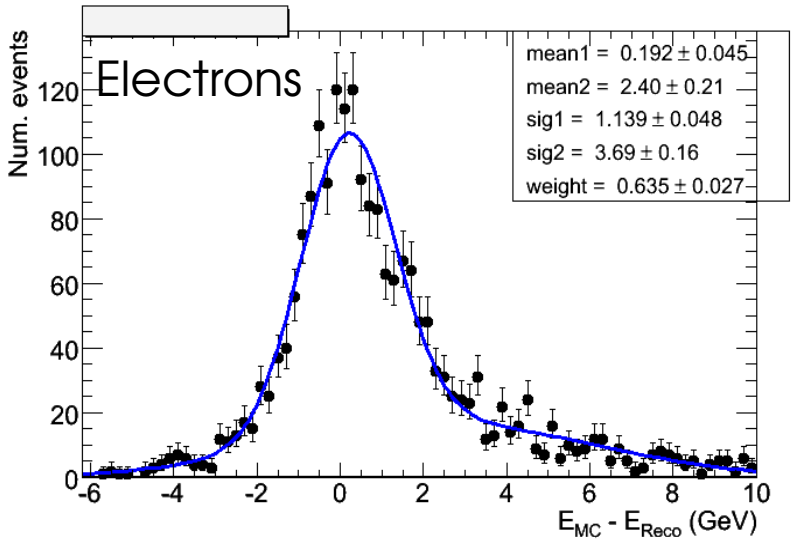


First test with MC momenta

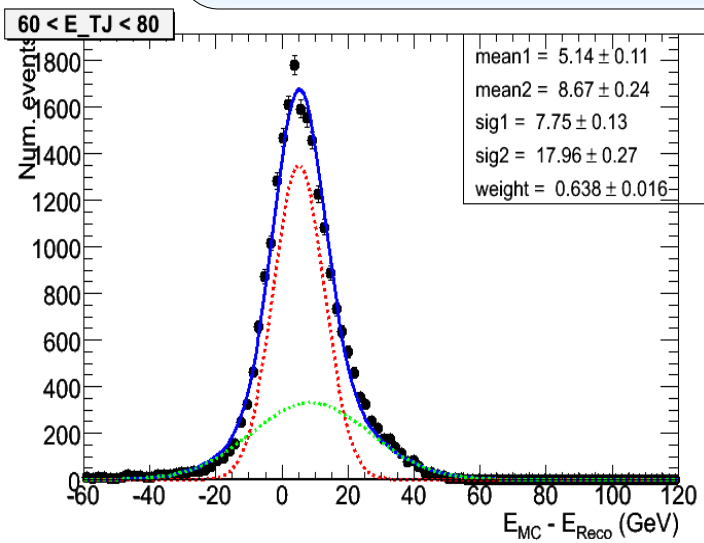
- Good linearity
- very small offset
- Smooth likelihood

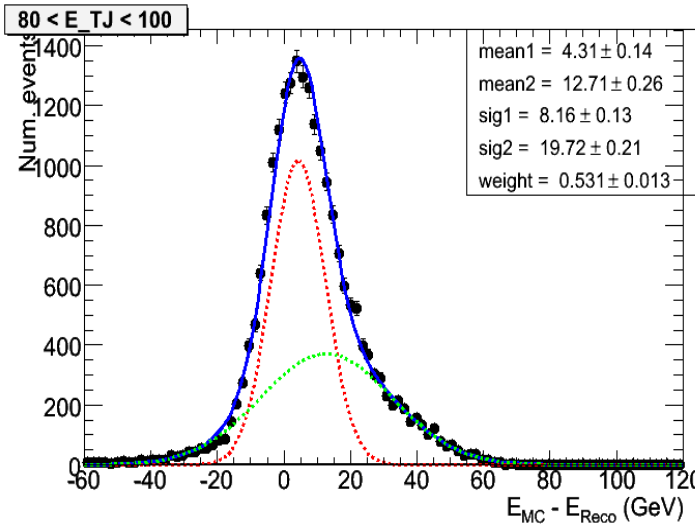
Transfer function (or detector resol. function)

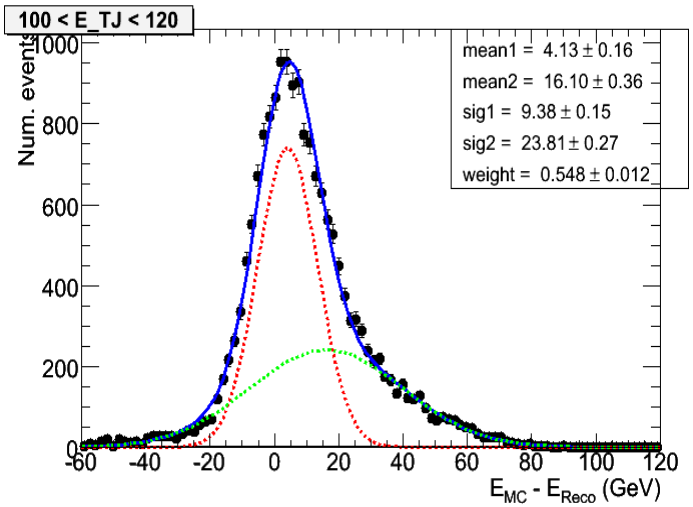
- Charged leptons and jets directions are measured
- Jets energy need a transfer function whose parameters change with the energy



Jets: leptonic side of lep+jets events (to have an independent sample)



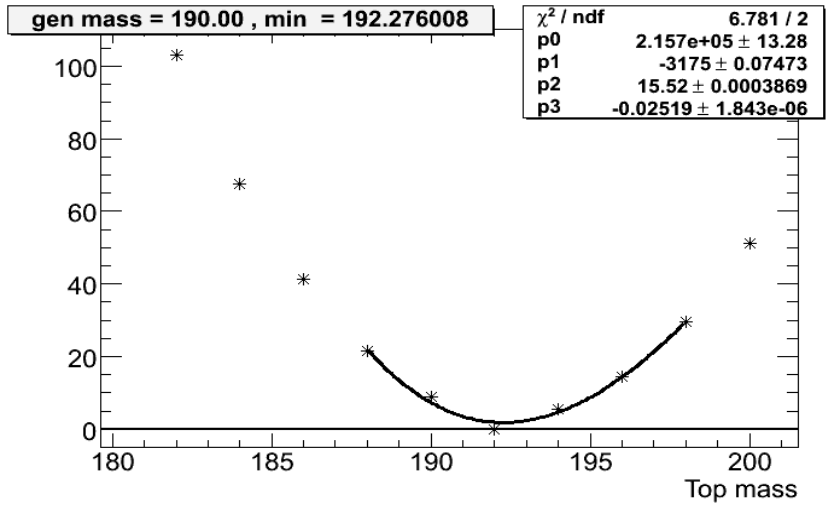


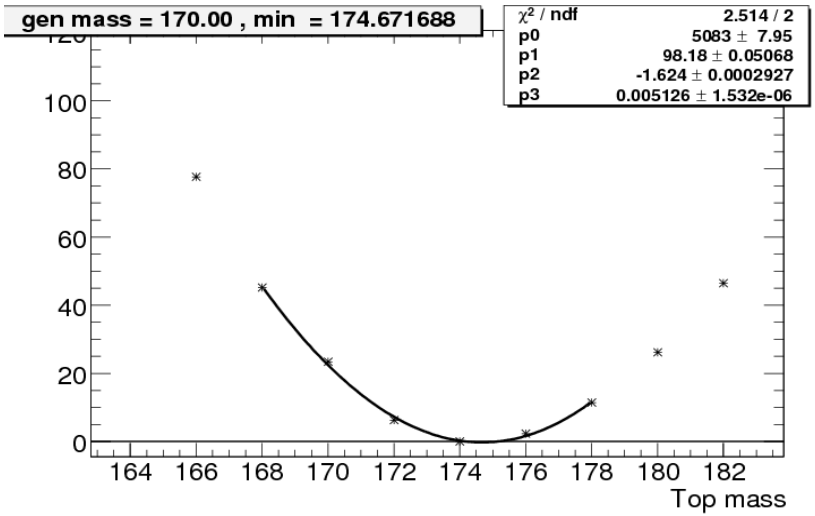


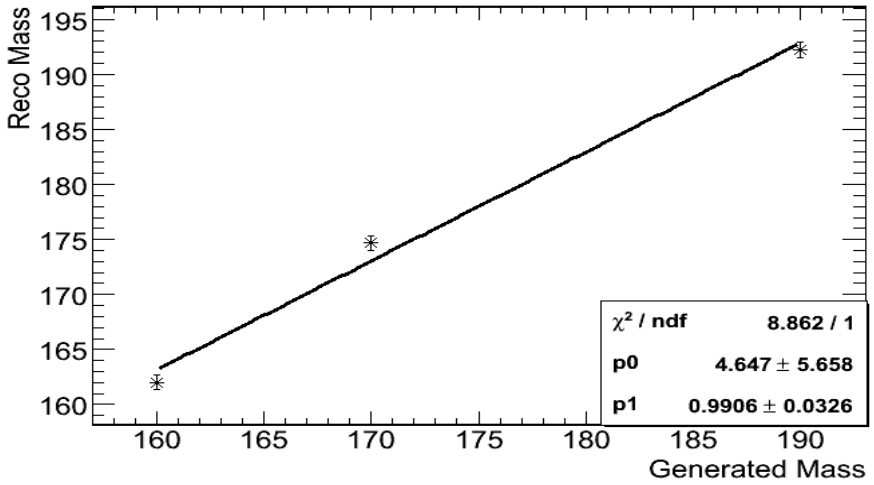
Using Reco Jets (matched with partons)

Using the MC MET to obtain the neutrino momenta:

The plug-in of the transfer functions do not spoil the shapes of the likelihood nor the linearity



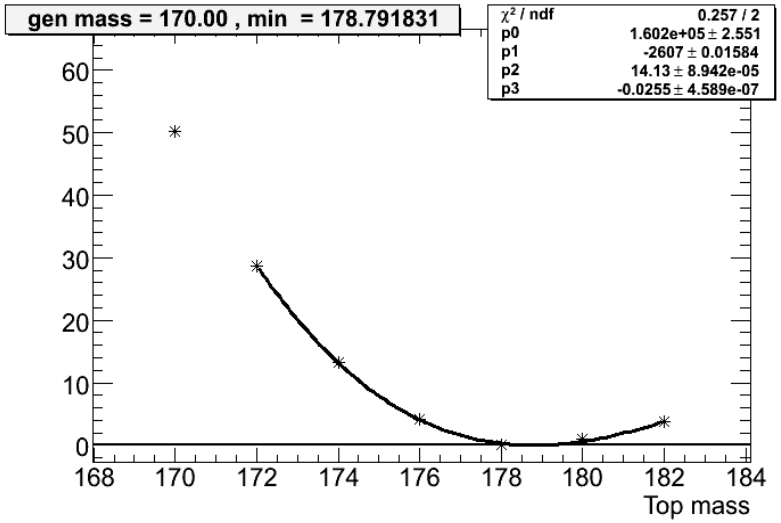


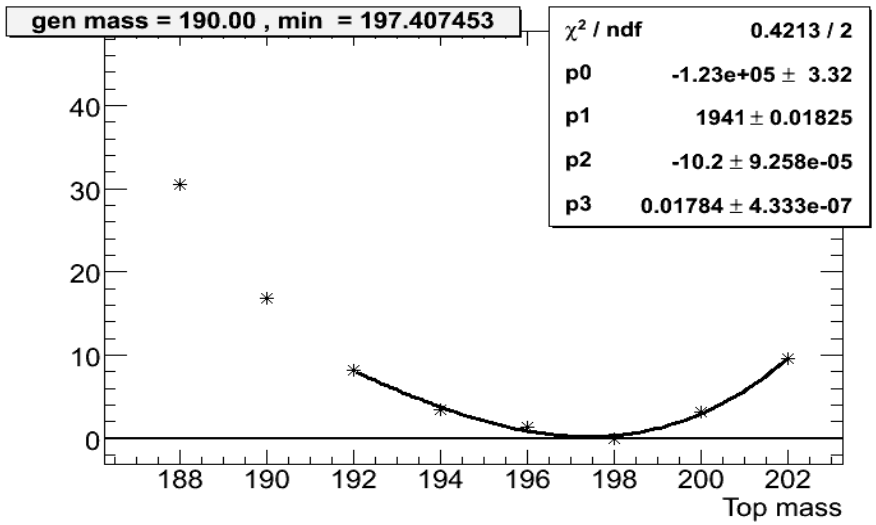


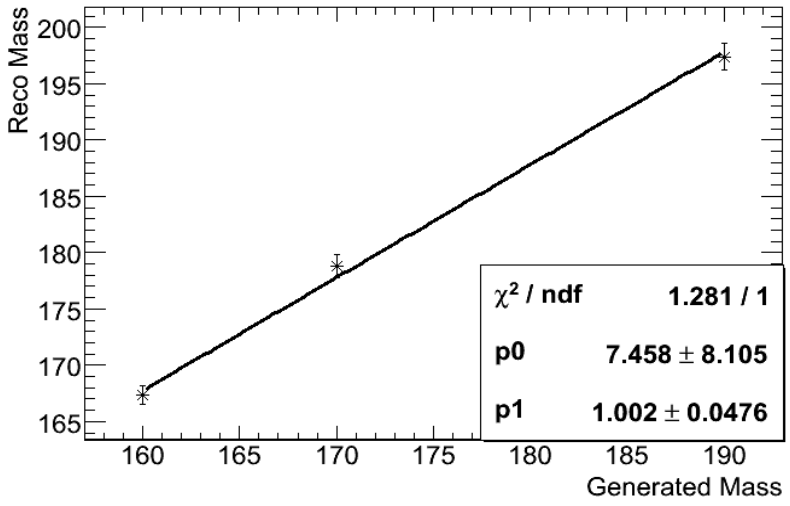
Using Reco Jets (matched with partons)

If we calculate the MET from the leptons and jets (hypothesis of ttbar produced at rest)

The likelihood are strongly shifted but still linear



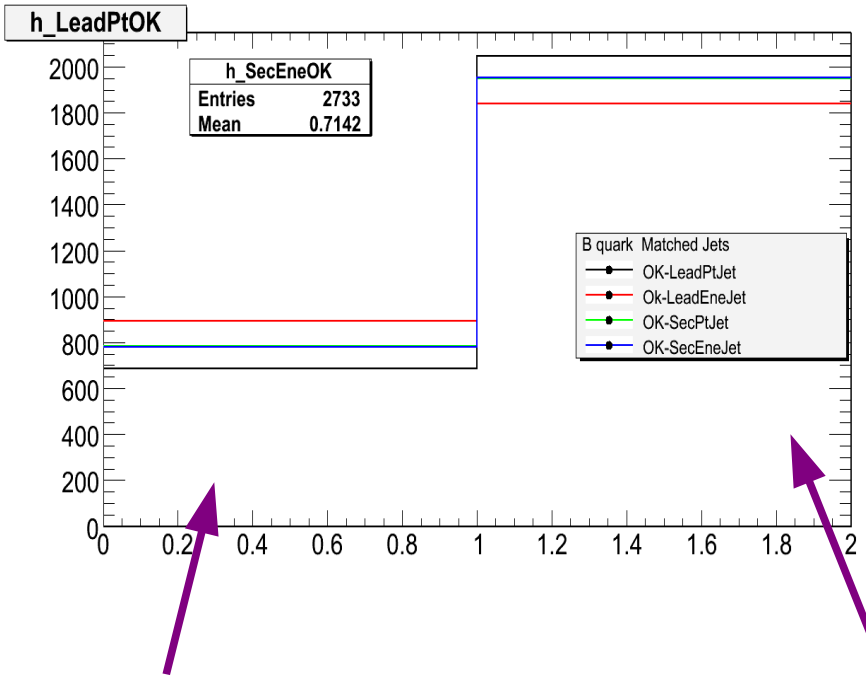




Using Reco Jets (w/o matching)

How to choose the 2 bjets in real life (without B-tagging)

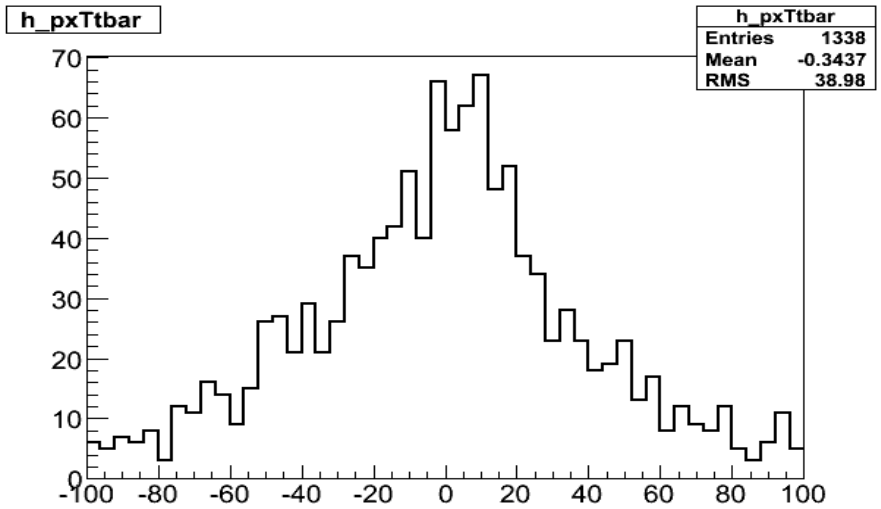
we study the two leading PT jets and the two most energetic.

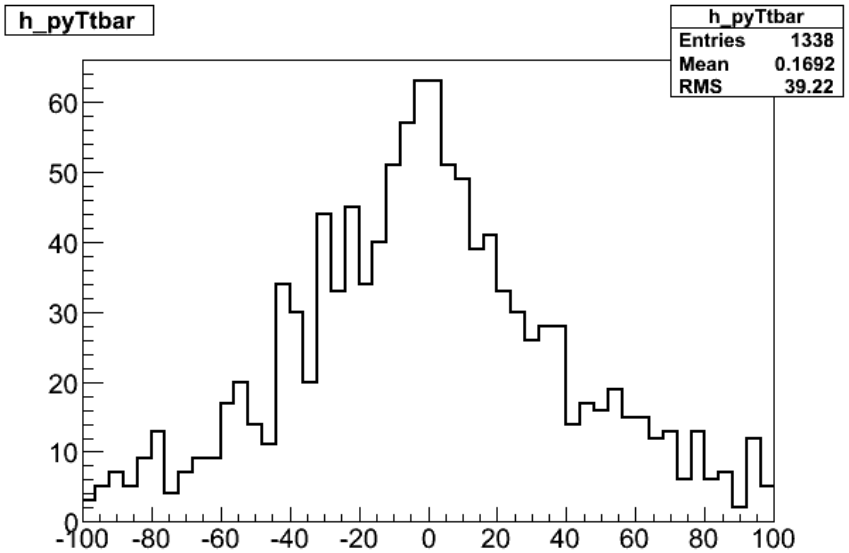


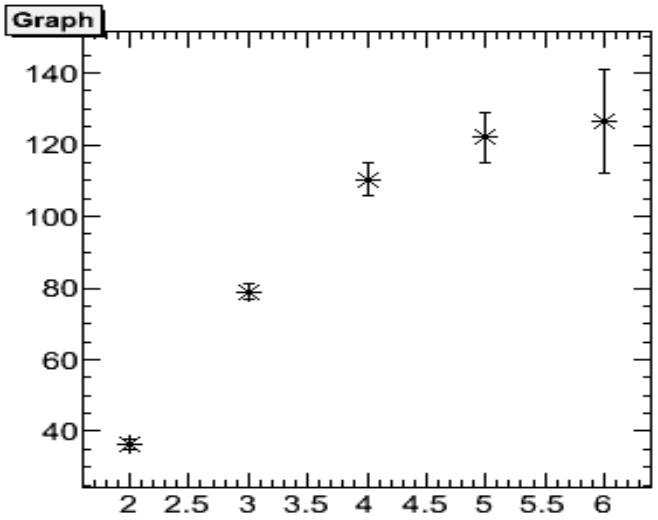
The jet does not match with the parton

The jet matches with the parton

Px_ttbar and Py_ttbar







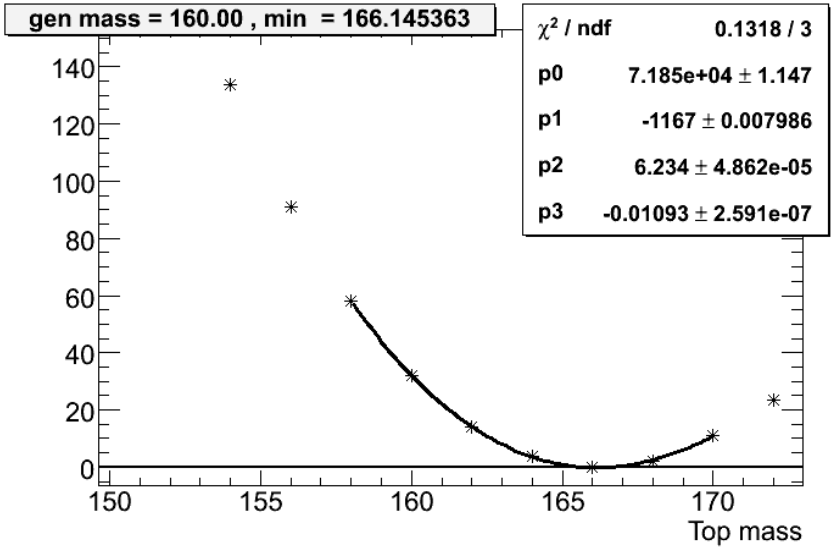
Very high PT --> the ttbar produced at rest is not valable.

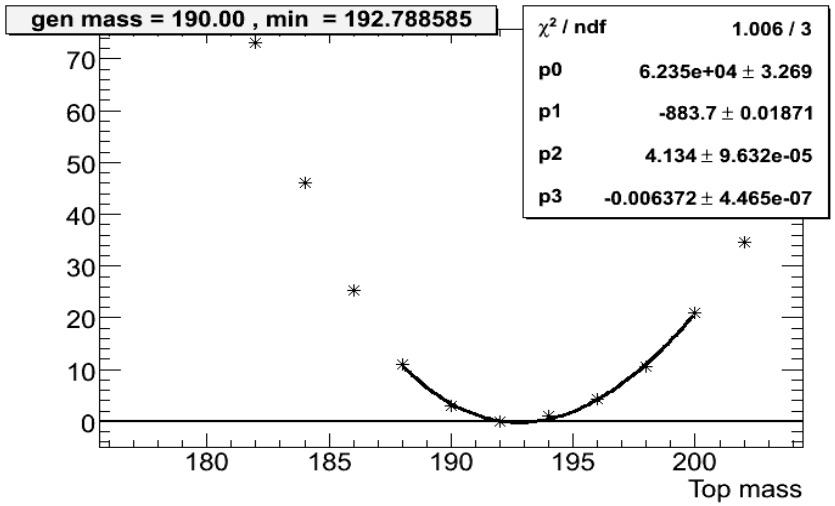
PT depens on number of jets produced.

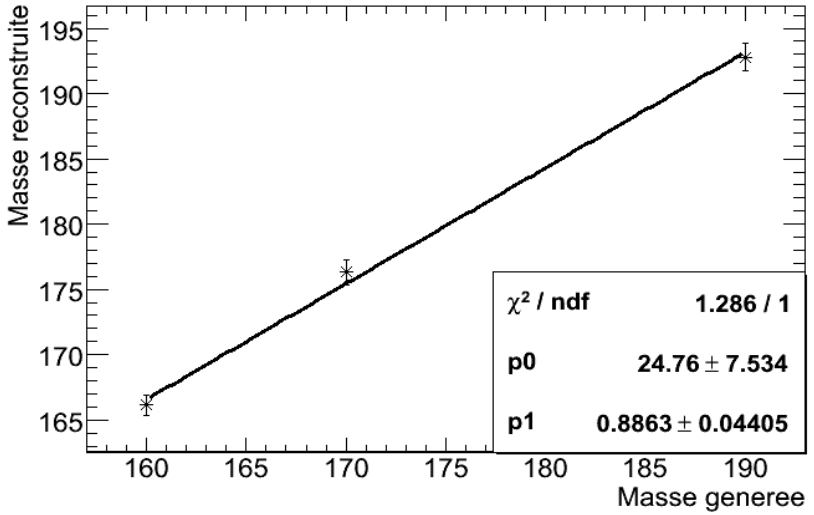
Our first test will be with events with exactly two jets

Two Jets events

Using two jets events the likelihoods are less shifted (in the approximation of ttbar produced at rest) but we loose in linearity

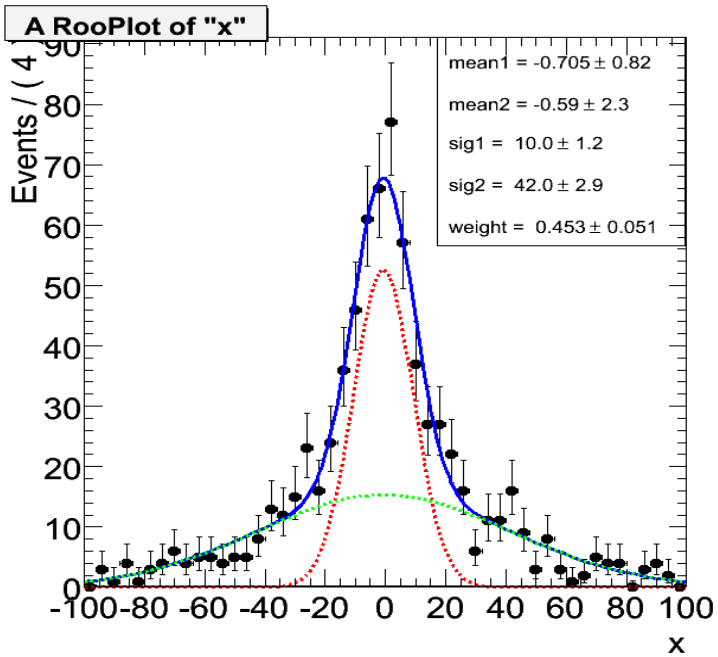


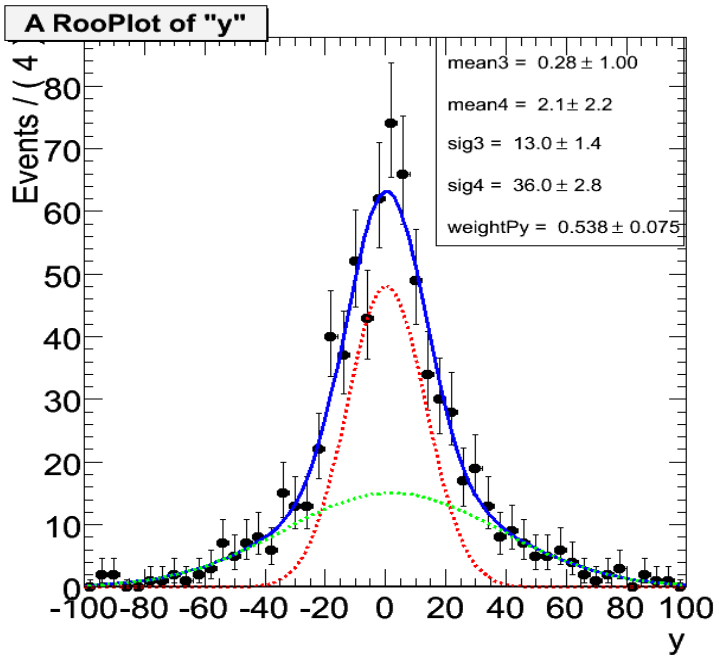




PT_ttbar transfer function

To have a better measure and in order not to depend on MET, an integration over px_ttbar and py_ttbar is necessary





Conclusions and Outlook

The method works well (smooth likelihood and linear behaviour) if the reconstructed objects match the parton

The high PT of the global event and error in jets identification spoil the result

Using events with only two jets we have better results even in the approximation of ttbar pair produced at rest

Preliminary results with:

- transfer functions on px_ttbar and py_ttbar
- B-tag applied on the second leading jet